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PRELIMINARY STUDIES ON THE CULTURE OF *ATYA CRASSA* IN OUTDOOR AND INDOOR TANKS

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ABSTRACT

A. crassa of sizes ranging 7.05± 0.13g to 8.5± 0.05g were purchased from fishermen around the Jebba Lake. They were transported in open jerry cans in a cold van for about two hours. The indoor tanks measured 3m x 2m x 1.5m while the out door tanks were 2m x 2m x 1.5m. The indoor tanks were stocked 17 prawns per tank while the outdoor tanks were stocked 10 prawns per tank. The experimental diets were formulated with crude protein levels 30%, 35% and 40%. The ingredients used were fishmeal, palm kernel cake, guinea corn, starch, calcium carbonate and these were fortified with premixes. Each diet was assigned to two tanks each indoors and outdoors. They were fed twice daily (9hrs and 19hrs) for 184 days. Positive growth was observed in both indoor and outdoor tanks. There was no significant difference in the growth of prawns fed outdoor (P>0.05). There was significant difference in the growth parameters of prawns fed the varying diets indoors. The percentage survival of prawns was higher outdoors and there was no significant difference (P>0.05) in the survival recorded in the three treatments. There was significant difference (P<0.05) in the survival of prawns in indoor tanks. The carcass composition of A. crassa fed the three diets show crude protein lower at harvest than the prawns stocked initially. Percentage lipid, ash and fibre of the harvested prawns were higher than at initial stocking. A. crassa is cultivable in freshwater and it should be reared with 30% crude protein diet in outdoor systems. Attempts should be made in the larval rearing of the species.

INTRODUCTION

Atya crassa is a decapod shrimp belonging to the family Atyidae. The eyes are well developed and pigmented, peropod I has arthrobranchiae while the carpus of pereopod II is very short, width greater than length, and deeply excavated anteriorly. It does not have supraorbital spines and exopods are absent.

Crustaceans in general and shrimps in particular, are high value aquatic food commodities globally (Kutty *et al* 2009). *M. rosenbergii* culture has progressed rapidly since 1999 to reach 42,780 t and 43,395ha in 2006 in South East Asia (Kutty *et al* 2009); in Brazil production increased from 40,000 to 60,128t during the period 2001-2002 (Dominguez and Alava 2009). Powell (1987) stated that there is potential for the culture of Nigerian palaemonid prawns of the genus *M. vollenhovenii* and *M. macrobrachion*. According to Powell (1987) these prawns require some saline water. Sagi and Aflalo (2005) stated that the growth of *M. rosenbergii* in culture systems may be affected by a wide variety of factors, such as gender, sexual maturity and age (Hartnoll 1982, botsford 1985;Aiken and Waddy 1992). Hartnoll (1982) observed that a number of crustacean species exhibit superior growth pattern in which males

exhibit superior growth to females. Sagi and Aflalo (2005) reported better growth for all-male population compared to all-female population of *M. rosenbergii*.

Antiporda (1986) stated that one of the major factors limiting the economic success in any commercial culture of a species is the food requirement. Feed cost is estimated to amount to 13-27% of the cost of production of shrimps. Antiporda (1986) also stated that accumulated knowledge on the nutrient requirements of shrimps is limited and lack of standard techniques among researches resulted to wide variation of findings. *A. crassa* culture has not been attempted as there was no available literature. *A. gabonensis* available in the lower Benue river is a close species to *A. crassa* and studies on it was on length –weight relationship and condition factor (Obande 2008). This study attempts to rear *A. crassa* in indoor and outdoor tanks with varying levels of protein.

MATERIALS AND METHODS

A. crassa of sizes ranging 7.05± 0.13g to 8.5± 0.05g were purchased from fishermen around the Jebba Lake. They were transported in open jerry cans in a cold van for about two hours. On arrival at the culture area fresh water was added to the jerry cans to dilute the heavy load of ammonia that has accumulated throughout the journey. The prawns were sorted out into sized and dead ones were separated.

The indoor tanks measured 3m x 2m x 1.5m while the out door tanks were 2m x 2m x 1.5m. The indoor tanks were stocked 17 prawns per tank while the outdoor tanks were stocked 10 prawns per tank. They were acclimated for seven days. The tanks were aerated with a 2HP blower throughout the period of the experiment.

The experimental diets were formulated with crude protein levels 30%, 35% and 40%. The ingredients used were fishmeal, palm kernel cake, guinea corn, starch, calcium carbonate and these were fortified with premixes (Table I). Each diet was assigned to two tanks each indoors and outdoors. They were fed twice daily (9hrs and 19hrs) for 184 days. The initial weight of the prawns was measured at stocking. After the feeding commenced bulk weighing was done monthly.

Proximate composition of the ingredients for formulation of feed was carried out (AOAC 2000) (Table 2). Samples of *A. crassa* were analyzed before and after the experiment for each treatment (AOAC 2000).

Statistical analysis was done using computer package SPSS version 10. Significant differences in means were measured using one-way Analysis of Variance (ANOVA) and Duncans multiple range test.

The growth parameters were calculated as follows:

Mean Weight Gain (MWG) =

$(Wt – Wo)/Wo$

Specific Growth Rate (SGR) (%/day) =

$100 \times (\ln Wt – \ln Wo)/t$

Feed Conversion Efficiency (FCE) = Weight gain (g)/ dry food intake

Table 1: Proximate composition of ingredients

Ingredients	% Moisture	% Protein	% Lipid	% Fibre	% Ash	% NFE
Palm kernel cake	3.93	9.29	9.30	19.00	4.04	54.44
Fish meal	4.95	63.44	21.95	0.80	11.49	Nil
Guinea corn	6.93	11.17	17.10	1.60	2.18	61.02

Table 2: Percentage composition of ingredients in diet

Ingredients	Diet I (30% c. p.)	Diet II (35% c. p.)	Diet III (40% c. p.)
Fish meal	290.00	387.20	484.40
Palm Kernel cake	325.00	276.40	227.80
Guinea corn	325.00	276.40	227.80
CaCO3	10.00	10.00	10.00
Starch	30.00	30.00	30.00
Premix	20.00	20.00	20.00

RESULTS AND DISCUSSION

Positive growth was observed in both indoor and outdoor tanks. There was no significant difference in the growth of prawns fed outdoor ($P>0.05$). There was significant difference in the growth parameters of prawns fed the varying diets indoors. The percentage survival of prawns was higher outdoors and there was no significant difference ($P>0.05$) in the survival recorded in the three treatments. There was significant difference ($P<0.05$) in the survival of prawns in indoor tanks. Summary of results are shown in Table 3.

A.crassa fed the three diets indoors showed significant difference ($P<0.05$) in all growth parameters. The growth of the prawns fed diet III showed better growth in terms of weight gain. The specific growth rate and food conversion efficiency showed that diet II and III had a superior and equal growth than diet I (Fig 1). This result varies from the report on *M. rosenbergii*, where there was no significant difference in the four treatments provided (Fujimura and Okamoto 1970); Balazs *et al* 1974 found each protein source having greater growth with increasing level of protein while Boonyaratpalin and New (1980) found no significant difference in the growth of three protein levels fed. This study compares well with Antiporda (1986), where all variables considered showed significant variation.

Table 3: Growth and Survival of *A. crassa* in indoor and outdoor tanks for 184 days

	MIW	MFW	MWG	FCE	SGR	SURVIVAL
INDOOR						
Diet I	8.12± 0.16	9.85±0.33a	1.78±0.27a	0.04±0.01a	0.11±0.02a	43.00±6.93c
Diet II	7.05± 0.13	9.77±0.00a	2.72±0.13ab	0.07±0.0b	0.18±0.01b	86.20±13.51bc
Diet III	8.43± 0.08	11.59±1.12b	3.26±0.73b	0.07±0.02b	0.18±0.03b	68.64±3.40b
OUTDOOR						
Diet I	8.32± 0.13	11.81±1.46b	3.29±0.97b	0.070.02b	0.18±0.04b	96.67±5.77c
Diet II	8.27± 0.15	10.34±0.62ab	2.26±0.40ab	0.04±0.01a	0.12±0.02ab	100.0±0.0c
Diet III	8.50± 0.05	11.47±1.11b	3.02±1.08ab	0.07±0.03b	0.16±0.05ab	100.0±0.0c

All figures with the same subscript in the same column are not significantly different

The outdoor experiment showed no significant variation (P>0.05) in all growth parameters of prawns fed various diets. This result is similar to Fujimura and Okamoto (1970) and Boonyaratpalin and New (1980) while it varies from the observations in Antiporda (1986) and Balazs *et al* (1974).

In comparing the growth of prawns in both indoor and outdoor tanks there was significant difference (P<0.05) in all growth parameters. It was observed that the growth of prawns fed diet II and diet III indoors is the same as that fed diet I outdoors in terms of SGR and FCE. From the foregoing the recommendation of Antiporda (1986) becomes relevant that in outdoor tanks the lower levels of protein is suitable due to high level of natural food. Further to this Tidwell et al. (1995) reported that prawns may be able to adjust to reductions in the nutritional value of prepared diets (i. e. protein source and vitamin content) by increasing predation on natural fauna (i.e. macro invertebrates) in the pond. In a situation where they cannot locate feed Coyle et al. (2003) citing, Weidenbach (1980) and Tidwell et al. (1995) reported that prawns would increase consumption of available vegetation to adjust to reduction in the nutritional value of prepared diets. This may be a likely occurrence in this current study.

Figure 1 shows that A. crassa fed diet containing 30% and 35% indoor had the same growth at harvest while outdoor the same scenario occurred with prawns fed 30% and 40%. During the 4^{th} and 5^{th} months of rearing the slight drop in growth of prawns fed 40% indoor and outdoor was due to mortality and moulting activity respectively

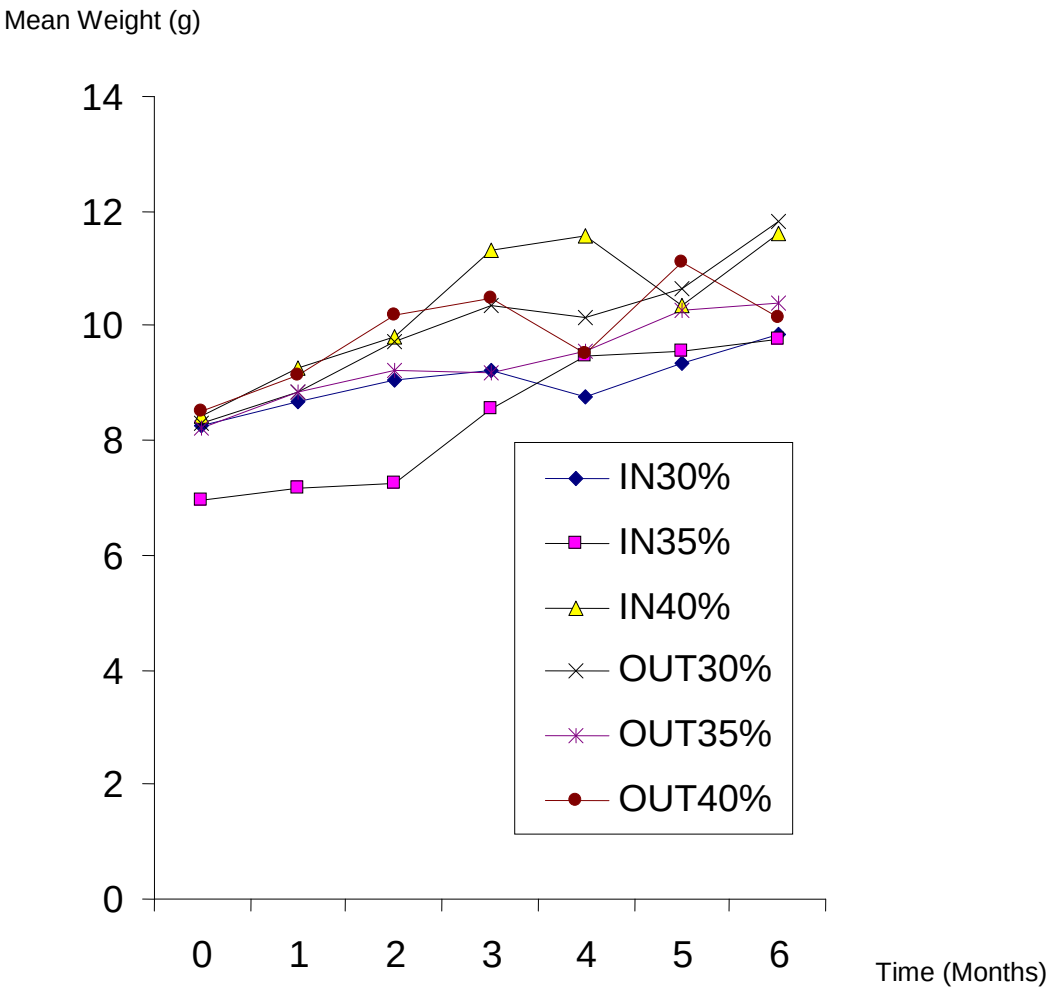

Figure 1: Growth of Atya crassa in indoor and outdoor tanks for 184 days using varying levels of protein

The carcass composition of *A. crassa* fed the three diets (Table 4) show crude protein lower at harvest than the prawns at initial stocking. This shows that the somatic increase in size does not necessarily result in increase in protein content. Percentage lipid, ash and fibre of the harvested prawns were higher than at initial stocking. The percentage moisture was lower at harvest than at initial stocking except for prawns fed diet II (35% c. p.) indoors. The NFE was higher at harvest than at initial stoking except for prawns fed diet I (30%) outdoors.

Table 3: Carcass composition of *A. crassa* in indoor and outdoor tanks fed with varying levels of protein

	Percentage Moisture	Percentage Protein	Percentage Lipid	Percentage Ash	Percentage Fibre	Percentage NFE
INDOOR						
Diet I	60.50	17.80	10.45	7.80	3.40	0.05
Diet I	65.40	12.66	10.20	5.94	4.30	1.49
Diet I	61.85	16.33	10.35	7.60	3.40	0.47
OUTDOOR						
Diet I	59.45	17.42	10.65	8.60	3.90	negligible
Diet I	60.60	15.99	10.09	9.60	3.70	0.02
Diet I	60.75	14.77	11.85	8.80	3.50	0.33
INITIAL	64.10	20.02	5.92	6.80	3.30	negligible

In outdoor experiment the survival was higher than the prawns reared indoor. The percentage survival of prawns in the indoor tanks varied significantly ($P<0.05$) while those outdoor did not. This could be attributed to higher natural food availability in the outdoor tanks.

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